Insectary Production of *Psyllaephagus bliteus* for the Control of the Eucalyptus Red Gum Lerp Psyllid

W. J. Roltsch, J. Brown, R. Morris, K. Casanave, J. C. Ball and S. Khasimuddin

Eucalyptus is a commonly planted tree in warm regions of the Southwest. There are more than 500 species of eucalyptus, most of which are native to Australia and Tasmania. A limited number of species are found in the Philippines, Java and New Guinea. The introduction of over 80 *Eucalyptus* species into California began before 1900. The majority of species presently grown are represented by approximately 20 species. Until the discovery of the eucalyptus longhorn beetle in California in 1984, eucalyptus was nearly pest-free within the western hemisphere.

The red gum lerp psyllid (RGLP) *Glycaspis brimblecombei* Moore, was first reported in California in June 1998 in El Monte, Los Angeles County. This sap-feeding pest, whose immature stages live under an excreted dome-shaped cap referred to as a lerp, has been found on several species of eucalyptus. Those most affected include: *Eucalyptus camaldulensis* Dehnh. (red gum), and *E. tereticornis* Smith, which are highly susceptible, and *E. rudis* Endl (flooded gum), which is considered moderately to highly susceptible. Within two years, the RGLP spread throughout the state and is currently one of the most serious pests attacking eucalyptus in California.

In 1999, Dr. Donald Dahlsten (University of California, Berkeley) collected several parasitoids attacking RGLP in Australia. These were held in quarantine until a protocol of host testing was performed to determine the safety and specificity of the parasitoids. One species, *Psyllaephagus bliteus*, was successfully reared, determined to be a host specific primary parasitoid, and released from quarantine.

The CDFA, Biological Control Program, obtained *P. bliteus* in 2000 and began to set up an insectary. It soon became apparent that both the RGLP and the parasitoid could not be easily reared. Initially, the basic rearing scheme for the parasitoid included 1-3 plants infested with a broad range of RGLP life stages placed into a 3 cu. ft. cage. Parasitoids were released into cages at a 40-1 to > 100-1 host to parasitoid ratio for each host life stage, including 2nd to 5th instars. The resulting first generations were consistently very small with well over 50% males (Fig. 1). When cages that contained several plants were kept active for approximately 6-8 weeks, it was found that parasitoid production improved, as did the parasitoid sex ratio. As a result of these findings, the following rearing procedure was implemented for the remainder of the year. Four female and four male *P. bliteus* were released into each newly setup cage containing 2-3 plants. In total we had 20 cages setup by September of 2001. Each cage was used for many months, requiring the removal of excess psyllid adults, or their addition if sufficient numbers were not present in a cage. Parasitoids were collected two or three times per week. On each collection date, all parasitoids were removed with the exception of four female and four males. Over time, plants in poor condition were replaced with new psyllid-infested plants.

Improvements to the greenhouse facility were completed by September 2001, including improved temperature and lighting control. Consequently, a narrow temperature range (23 – 29^{o} C), and a constant long day length of 16:8 L/D were achieved using high-pressure sodium lights. The results of the modifications are apparent in Figure 1. After approximately 6-8 weeks, following several generations, 30 to 60 parasitoids emerged on average from each cage per week.

Typically, 9 to 15 cages produced parasitoids on a given week. Overall, the moving average presentation of per cage production illustrates a marked improvement in production by late-September. This coincided with the completion of facility improvements. In addition, detailed records showed that the parasitoid sex ratio was relatively stable at 1:1 from mid-September onward (Fig. 1). The moving average was calculated by averaging the current value with values of the three previous weeks. Total parasitoid production in the insectary increased greatly in the fall as a result of greater production per cage and an increased number of total cages. In mid-December the removal of females was relaxed on several occasions. Following this period, there was a marked increase in production in late December. During this week, a total of nearly 1800 *P. bliteus* were collected. This would seem to illustrate the potential of this rearing system when a greater number of females are left in the cages during each collection date with suitable numbers of immature psyllids.

For 2002, adult psyllids will be removed from cages and destroyed. Psyllids from the psyllid insectary will be added as necessary. This will be done to prevent the selection of a parasitoid resistant psyllid population within the parasitoid production cages.

In 2001, over 10,265 *P. bliteus* were produced and released into field nursery sites. Because the increase in production occurred in the fall, the majority of this material was released in the southern counties of California during mid-fall through winter. During late spring and summer of 2002, releases will be completed in each of the affected counties where releases have not yet taken place. Dahlsten (personal communication) has reported that establishment has occurred in eight coastal counties from the San Francisco Bay Area to San Diego County.

Fig. 1. Sex ratio and average weekly production of P. bliteus per cage